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# RIGOL

## Data Sheet

### DS1000E, DS1000D Series Digital Oscilloscopes

DS1102E, DS1052E, DS1102D, DS1052D

#### Product Overview

DS1000E, DS1000D series are kinds of economical digital oscilloscope with high-performance.

DS1000E series are designed with dual channels and 1 external trigger channel.

DS1000D series are designed with dual channels and 1 external trigger channel as well as 16 channels logic analyzer.



#### Applications

- Electronic Circuit Test
- Circuit Functional Test
- Logical Relation Between Signals Verification
- Circuit of Mixed Signal Test
- Education & Training

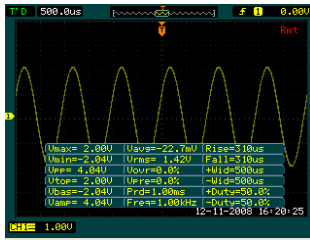
#### Easy to Use Design

- Built-in help menu enables information getting more convenient
- Multiple Language User Interface, support Chinese & English input
- Support U disk and local files storage
- Waveform intensity can be adjusted
- To display a signal automatically by **AUTO**
- Pop-up menu makes it easy to read and use

#### Main Features

- Dual analog channels and 16 channels logic analyzer, 100MHz maximum bandwidth, 1GSa/s maximum real-time Sample rate and 25GSa/s maximum equivalent Sample rate
- 5.6 inch and 64 k TFT LCD make the waveform displays more clear and vivid
- Abundant trigger types: Edge, Pulse Width, Video, Slope, Alternate, Pattern and Duration
- Unique adjustable trigger sensitivity enables to meet different demands
- Enable to measure 20 types of wave parameters and track measurements via cursor automatically
- Unique waveform record and replay function
- Fine delayed scan function
- Built-in FFT function, hold practical digital filters
- Pass/Fail detection function enables to output testing results
- Math operations available to multiple waves
- Powerful PC application software UltraScope
- Standard configuration interface: USB Device, USB Host, RS-232 and support U disk storage and PictBridge print standards
- The new function "Key Lock" can meet the needs of industrial production
- Support for remote command control

## ➤ Automatically Measure 20 Wave Parameters

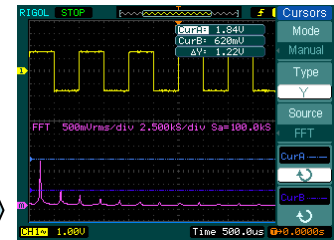


Automatic measure

DS1000E, DS1000D series oscilloscopes provide 20 types of wave parameters for automatically measuring, which contains 10 Voltage and 10 Time parameters.

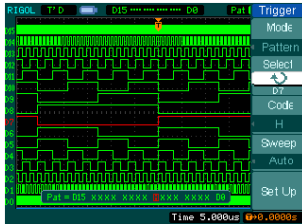
In cursor mode, users can easily measure by moving cursor. Besides, 3 types of cursor measurement are optional: Manual, Track and Auto.

## ➤ Cursor Measure



FFT cursor measure

## ➤ Multiple Trigger



Pattern trigger

Both DS1000E and DS1000D series contain abundant triggers:

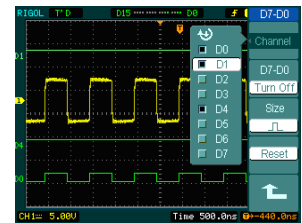
- Edge trigger, Pulse Width trigger, Video trigger, Slope trigger
- Alternate trigger, Pattern trigger (DS1000D), Duration trigger (DS1000D)

Especially the duration trigger is a new type from perfect combination of patten and pulse width trigger. Unique function of adjustable trigger sensitivity is good for filtering possible noise from signal in order to avoid false triggers.

## ➤ 16 Channels Logic Analyzer

Being equipped with 16 channels logic analyzer, DS1000D series mixed signal oscilloscopes achieve mixed signal measure coordinating with 2 analog channels.

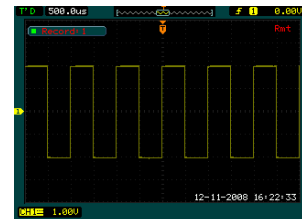
Each channel can be turned on or off independently, or in groups of 8(D7-D0 and D15-D8); also, you can set waveform size and threshold types or change the display position on screen for digital channel.



Digital channels setup

## ➤ Waveform Recording

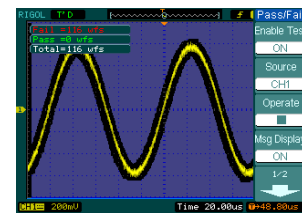
In virtue of waveform recording function from DS1000E and DS1000D, not only the outputs from two channels could be recorded, but also the waves outputted by Pass/Fail test could be easily recorded. Totally, up to 1000 frames of waves are available to record. Besides, users can analyze waves according to real or save transient waves so as to get more exact datum.



Waveform recording

## ➤ Pass/Fail Testing

The Pass/Fail function monitors the changes of signals by comparing whether the input signal is within the pre-defined mask. The testing results not only can be displayed on screen or output by isolated pass/fail port, but also can be alarmed according to turn on system sound.



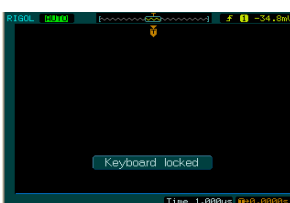
Pass/Fail testing

Type	Value	Under Limit	Over Limit	Pass/Fail
Umax	2.00V			Pass
Umin	-2.04V			Pass
Upp	4.04V			Pass
Ulow	-4.00V			Pass
Ubase	2.04V			Pass
Uame	4.04V			Pass
Urms	1.42V			Pass
Prd	1.00ms			Pass
Freq	1.00kHz			Pass
Rise	310ns			Pass
Fall	310ns			Pass
+U1	300ns			Pass
-U1	300ns			Pass
+Duty	50.0%			Pass
-Duty	50.0%			Pass

Measurement window

## ➤ UltraScope Software

RIGOL provides powerful PC application software: UltraScope, which enables to: Capture and measure wave; Perform local or remote operation; Save waves as ".bmp" format; Save files as ".txt" or ".xls" format; Print waveforms.



Key Lock function

## ➤ Key Lock

This function is widely used in most productions. All keys are locked except F1 to F5 and MENU ON/OFF in this mode.

To lock the keyboard, use menu; to unlock, correct code has to be input. Also, you can reset a new code if necessary.

# Specifications

All specifications apply to DS1000E, DS1000D Series Oscilloscopes unless where noted. To come up to these specifications, two conditions must be met firstly:

- The instrument must have been operated continuously for 30 minutes under the specified operating temperature.
- Do perform Self-Calibration operation through the Utility menu if the range of operating temperature variations up to or more than 5°C.

**NOTE:** All specifications are guaranteed unless where marked "typical".

## Specifications

<b>Bandwidth</b>				
DS1102E	DS1052E	DS1102D	DS1052D	
100MHz	50MHz	100MHz	50MHz	
<b>Acquisition</b>				
Sample Modes	Real-Time Sample	Equivalent Sample		
Sample Rate	1GSa/s <sup>[1]</sup> , 500MSa/s	DS1102X	DS1052X	
		25GSa/s	10GSa/s	
Averages	The waveform will be displayed one time while all the channels finish N times Sample, N could be selectable from 2, 4, 8, 16, 32, 64, 128 and 256			
<b>Inputs</b>				
Input Coupling	DC, AC, GND			
Input Impedance	1MΩ±2%, the input capacity is 18pF±3pF			
Probe Attenuation Factors	1X, 5X, 10X, 50X, 100X, 500X,1000X			
Maximum Input Voltage	400V (DC+AC Peak, 1MΩ input impedance)			
	40V (DC+AC Peak) <sup>[2]</sup>			
Time Delay between Channel (typical)	500ps			
<b>Horizontal</b>				
Sample Rate Range	Real-Time: 13.65Sa/s-1GSa/s Equivalent: 13.65Sa/s-25GSa/s			
Waveform Interpolation	Sin(x)/x			
Memory Depth	Channel Mode	Sample rate	Memory Depth (normal)	Memory Depth (long memory)
	Single channel	1GSa/s	16kpts	N.A.
	Single channel	500MSa/s or lower	16kpts	1Mpts
	Dual channel	500MSa/s or lower	8kpts	N.A.
	Dual channel	250MSa/s or lower	8kpts	512kpts
Scanning Speed Range (Sec/div)	2ns/div~50s/div, DS1102X 5ns/div~50s/div, DS1052X 1-2-5 Sequence			
Sample Rate and Delay Time Accuracy	±50ppm (any interval ≥1ms)			
Delta Time Measurement Accuracy (Full Bandwidth)	Single: ±(1 Sample interval + 50ppm × reading + 0.6 ns) >16 averages: ±(1Sample interval + 50ppm × reading + 0.4 ns)			

<b>Vertical</b>		
A/D Converter	8-bit resolution, all channels sample simultaneously	
Volts/div Range	2mV/div~10V/div (at the input terminal connecting to BNC)	
Maximum Input	Maximum input voltage on analog channel CAT I 300Vrms, 1000Vpk; instantaneous overvoltage 1000Vpk CAT II 100Vrms, 1000Vpk RP2200 10:1: CAT II 300Vrms RP3200 10:1: CAT II 300Vrms RP3300 10:1: CAT II 300Vrms	
Offset Range	±40V (250mV/div~10V/div) ±2V (2mV/div~245mV/div)	
Analog Bandwidth	100MHz (DS1102D, DS1102E) 50MHz (DS1052D, DS1052E)	
Single-shot Bandwidth	100MHz (DS1102D, DS1102E) 50MHz (DS1052D, DS1052E)	
Selectable Analog Bandwidth Limit (typical)	20MHz	
Lower Frequency Response (AC -3dB)	≤5Hz (at input BNC)	
Rise Time at BNC (typical)	<3.5ns, <7ns, respectively at 100MHz, 50MHz	
Dynamic range	±5div	
DC Gain Accuracy	2mV/div-5mV/div: ±4% (In Normal or Average acquisition mode) 10mV/div-10V/div: ±3% (In Normal or Average acquisition mode)	
DC Measurement Accuracy, Average Acquisition Mode	When vertical displacement is zero, and $N \geq 16$ : $\pm(\text{DC Gain Accuracy} \times \text{reading} + 0.1\text{div} + 1\text{mV})$ When vertical displacement is not zero, and $N \geq 16$ : $\pm[\text{DC Gain Accuracy} \times (\text{reading} + \text{vertical displacement}) + (1\% \text{ of vertical displacement}) + 0.2\text{div}]$ When vertical scale is between 2mV/div and 245mV/div, add 2mV more for setting value. When vertical scale is between 250mV/div and 10V/div, add 50mV more for setting value.	
Delta Volts Measurement Accuracy (Average Acquisition Mode)	Under same setting and condition, the voltage difference ( $\Delta V$ ) between any two points in the waves coming from the average of more than 16 waves have been acquired: $\pm(\text{DC Gain Accuracy} \times \text{reading} + 0.05 \text{div})$	
<b>Trigger</b>		
Trigger Sensitivity	0.1div~1.0div (adjustable)	
Trigger Level Range	Internal	±6 divisions from center of screen
	EXT	±1.2V
Trigger Level Accuracy (typical) applicable for the signal of rising and falling time ≥20ns	Internal	±(0.3div × V/div)(±4 divisions from center of screen)
	EXT	±(6% of setting + 200 mV)
Trigger Offset	In Normal mode: pre-trigger (memory depth/ 2*Sample rate), delayed trigger 1s	
	In Slow Scan mode: pre-trigger 6div, delayed trigger 6div	
Trigger Holdoff Range	500ns~1.5s	
Set Level to 50% (typical)	When input signal frequency ≥50Hz	
<b>Edge Trigger</b>		
Edge trigger slope	Rising, Falling, Rising + Falling	
<b>Pulse Width Trigger</b>		

Trigger Condition	(>, <, =) Positive pulse width, (>, <, =) Negative pulse width	
Pulse Width Range	20ns ~10s	
<b>Video Trigger</b>		
Video Standard Line Frequency	Support for standard NTSC, PAL and SECAM broadcast systems. Line number range: 1~525 (NTSC) and 1~625 (PAL/SECAM)	
<b>Slope Trigger</b>		
Trigger Condition	(>, <, =) Positive slope, (>, <, =) Negative slope	
Time Setting	20ns~10s	
<b>Alternate Trigger</b>		
Trigger on CH1	Edge, Pulse Width, Video, Slope	
Trigger on CH2	Edge, Pulse Width, Video, Slope	
<b>Pattern Trigger</b> <sup>[2]</sup>		
Pattern Type	D0~D15 select H, L, X, $\bar{f}$ , $\bar{t}$	
<b>Duration Trigger</b> <sup>[2]</sup>		
Pattern Type	D0~D15 select H, L, X	
Qualifier	>, <, =	
Time Setting	20ns~10s	
<b>Measurements</b>		
Cursor	Manual	Voltage difference between cursors ( $\Delta V$ ) Time difference between cursors ( $\Delta T$ ) Reciprocal of $\Delta T$ in Hertz ( $1/\Delta T$ )
	Track	Voltage value for Y-axis waveform Time value for X-axis waveform
	Auto	Cursors are visible for Automatic Measurement
Auto Measure	Vpp, Vamp, Vmax, Vmin, Vtop, Vbase, Vavg, Vrms, Overshoot, Preshoot, Freq, Period, Rise Time, Fall Time, +Width, -Width, +Duty, -Duty, Delay1→2 $\bar{f}$ , Delay1→2 $\bar{t}$	

**Remarks:**

[1] Only one channel is available when the Sample rate is 1GSa/s.

[2] For DS1000D Series.

## General Specifications

<b>Display</b>		
Display Type	145mm (5.6 inch) diagonal TFT Liquid Crystal Display	
Display Resolution	320 horizontal ×RGB×234 vertical pixels	
Display Color	64k color	
Display Contrast (typical)	150:1	
Backlight Brightness (typical)	300 nit	
<b>Probe Compensator Output</b>		
Output Voltage (typical)	Approximately 3Vpp (peak to peak value)	
Frequency (typical)	1kHz	
<b>Power Supply</b>		
Supply Voltage	100 ~ 240VAC <sub>RMS</sub> , 45~440Hz, CAT II	
Power Consumption	Less than 50W	
Fuse	2A, T level, 250 V	
<b>Environmental</b>		
Ambient Temperature	Operating 10°C ~ 40°C	
	Non-operating -20°C ~ +60°C	
Cooling Method	fan cooling	
Humidity	below +35°C: ≤90% relative humidity	
	+35°C ~ +40°C: ≤60% relative humidity	
Altitude	Operating at 3,000 m or below	
	Non-operating at 15,000 m or below	
<b>Mechanical</b>		
Dimensions	Width	303mm
	Height	154mm
	Depth	133mm
Weight	Without package	2.3kg
	Packaged	3.5kg
<b>IP Protection</b>		
IP2X		
<b>Calibration Interval</b>		
The recommended calibration interval is one year		